

## PATENT ABSTRACTS OF JAPAN

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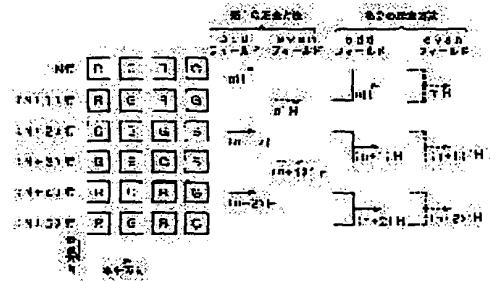
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## (54) DRIVE METHOD FOR SOLID STATE IMAGE PICKUP ELEMENT AND IMAGE PICKUP DEVICE

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain the successive scanning video signals by means of an existing solid state image pickup element.

**SOLUTION:** The signals are read out of a solid state image pickup element having horizontal pixel strings of  $2N$  lines or more in the vertical direction ( $N$ : an integer of 2 or more). In this case, the combination of two horizontal pixel strings which are simultaneously read out in a single horizontal scan like a 2nd scanning method is always defined as the same horizontal pixel string in every vertical scanning period. Then the output signals which are read out in the preceding drive method are processes, and the successive scanning video signals of  $N$  vertical scanning lines are outputted.



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## CLAIMS

## [Claim(s)]

[Claim 1] By reading, after mixing the signal charge of two pixels which adjoin perpendicularly the scanning state of the level pixel train of the solid state image pickup device which has a level pixel train more than 2-N (N is two or more integers) line perpendicularly The drive method of the solid state image pickup device characterized by making into the always same level pixel train combination of two level pixel trains read simultaneously by the \*\* perpendicular scanning interval by one horizontal scanning in case the signal of two adjoining level pixel trains is simultaneously read by one horizontal scanning and a full screen is scanned in 1 vertical-scanning period.

[Claim 2] The signal charge of two pixels which adjoin perpendicularly the scanning state of the level pixel train of a color solid state image pickup device where the level line of two lines the level line whose horizontal array of a color filter is the 1st array, and whose 1st array of the above are the 2nd different array was allotted perpendicularly by turns [ each ], respectively is mixed. since -- by reading The signal of two adjoining level pixel trains The drive method of the solid state image pickup device according to claim 1 characterized by making into the always same level pixel train combination of two level pixel trains read simultaneously by the \*\* perpendicular scanning interval by one horizontal scanning in case it reads simultaneously by one horizontal scanning and a full screen is scanned in 1 vertical-scanning period.

[Claim 3] The solid state image pickup device which has a level pixel train more than 2-N (N is two or more integers) line perpendicularly, By reading, after mixing the signal charge of two pixels which adjoin the scanning state of the level pixel train of this solid state image pickup device perpendicularly The solid-state-image-pickup-device drive circuit which makes combination of two level pixel trains read simultaneously the always same level pixel train by the \*\* perpendicular scanning interval by one horizontal scanning in case the signal of two adjoining level pixel trains is simultaneously read by one horizontal scanning and a full screen is scanned in 1 vertical-scanning period, Image pck-up equipment characterized by having the digital disposal circuit which processes the aforementioned solid-state-image-pickup-device output signal, and outputs the video signal of sequential scanning of a number of vertical-scanning lines N book.

[Claim 4] The color solid state image pickup device perpendicularly matched with the level line of two lines the level line whose horizontal array of a color filter is the 1st array, and whose 1st array of the above are the 2nd different array by turns [ each ], respectively, By reading, after mixing the signal charge of two pixels which adjoin the scanning state of the level pixel train of this color solid state image pickup device perpendicularly The solid-state-image-pickup-device drive circuit which makes combination of two level pixel trains read simultaneously the always same level pixel train by the \*\* perpendicular scanning interval by one horizontal scanning in case the signal of two adjoining level pixel trains is simultaneously read by one horizontal scanning and a full screen is scanned in 1 vertical-scanning period, Image pck-up equipment according to claim 3 characterized by having the digital disposal circuit which processes the aforementioned solid-state-image-pickup-device output signal, and outputs the video signal of sequential scanning of a number of vertical-scanning lines N book.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the image pck-up equipment which used the drive method of a solid state image pickup device, and this drive method. Furthermore, it is related with the drive method of the image pck-up equipment which can obtain the video signal of sequential scanning using the existing solid state image pickup device, and the solid state image pickup device for it in detail.

[0002]

[Description of the Prior Art] As shown in drawing 4 (A) and (B) in order of the scanning to each level pixel train of the general solid state image pickup device used for an electronic still camera or a video camera, there are two methods greatly.

[0003] The 1st method scans the level pixel train with which the pixel 20 was located in a line in the signal charge accumulated at each pixel in the 1st field (Odd field) every other vertical train, as shown in drawing 4 (A) (scan shown as the solid line of drawing 4 (A)). It is the method of not scanning previously in the 2nd field (even field), or scanning the remaining level pixel train (scan shown with the dashed line of drawing 4 (A)), and reading all signal charges in the two fields (=1 frame).

[0004] In order that the 2nd method may prevent vertical resolution degradation when it is the method of scanning two level pixel trains which adjoin by one horizontal scanning, and reading all signal charges in the 1 field and is used for a video camera, as shown in drawing 4 (B), 1 train staggering \*\*\*\*\* of the pair of two level pixel trains simultaneously read by the horizontal scanning of 1 view in the 1st field (odd field) and the 2nd field (even field) like the scan shown as the solid line of drawing 4 and the scan shown with a dashed line is carried out perpendicularly.

[0005] The 1st method has the advantage in which a frame picture is acquired, and is suitable for photography record of the good picture of a vertical definition.

[0006] It has the advantage in which the number of sheets of the picture which there is so big no difference by the frame picture as synthetic quality of image even if perpendicular functionality of a picture is generally strong while there is a fault that, as for the 2nd method, only a field picture is acquired, but a vertical definition deteriorates, and a vertical definition becomes half, and can be recorded on one record medium as compared with a frame picture becomes double precision.

[0007] Therefore, with the electronic still camera, using it according to a situation, switching the 1st and the 2nd scanning method is considered from the former.

[0008] However, although the same output is obtained at the 1st scanning method in the horizontal scanning line to which the odd field and the even field correspond when it is the color solid state image pickup device matched for each pixel with the mosaic-like color filter, as shown in drawing 5 or drawing 6 , the signal outputs obtained in the odd field and the even field differ in the 2nd scanning method.

[0009] That is, the signal as the time of the 1st scanning method with the same signal output of the odd field is acquired, although color separation is performed by the same signal-processing method and a required signal (for example, a luminance signal Y, and abbreviation R-Y, two color-difference signals of B-Y) is acquired, the signal output of the even field cannot perform color separation by the same signal-processing method, and a required signal is not acquired. This is explained in more detail.

[0010] In the color filter shown in drawing 5 , in the 1st scanning method The odd field and the even field scan the Nth line and a line (N+1), respectively at the time of the horizontal scanning of nH and an n'H eye. By using correlation of 1H period, since R and G component are obtained for every pixel, and a line and a line (N+3) are scanned, respectively (N+2) to eye '[ of the even field ] (n+1) H [ H (n+1) of the odd field, and ] and G and B component are obtained for every pixel (R+2 G+B) The luminance signal which consists of a component, and two sorts of color-difference signals,

R-G and B-G, are obtained, and the signal corresponding to the standard television system can be formed.

[0011] On the other hand by the 2nd scanning method, the signal of the Nth line and a line (N+1) is simultaneously read to nH eye in the odd field. Since 2R and 2G component are obtained, the signal of a \*\* (N+2) line and a line (N+3) is simultaneously read to eye H (n+1) and 2G and 2B component are obtained, a signal of the same kind can be acquired by the same signal-processing method as the time of the 1st scanning method.

[0012] However, in the even field, a \*\* (N+1) line and a line (N+2) are simultaneously read to an n'H eye. A component and a component (B+G) are obtained and a \*\* (N+3) line and a line (N+4) are simultaneously read to eye '(n+1) H. (R+G) (R+G) Since a component and a component (G+B) are obtained, by the same signal-processing method as the time of the 1st scanning method, color separation cannot be performed and a signal of the same kind cannot be acquired.

[0013] Next, with the color filter shown in drawing 6, the odd field and the even field scan the Nth line and a line (N+1) by the 1st scanning method, respectively at the time of the horizontal scanning of nH and an n'H eye,  $1/2 \{ (Cy+G+Ye+Mg) = R+B+3/2G \}$  signal is acquired as a low-frequency component, and  $1/2 \{ (Cy+G)-(Ye+Mg) \} = -(R-G/2)$  signal is acquired as a modulation component.

[0014] Moreover, to eye '[ of the even field ] (n+1) H [ H (n+1) of the odd field, and ], a line and a line (N+3) are scanned, respectively (N+2),  $1/2 \{ (Cy+Mg+Ye+G) = R+B+3/2G \}$  signal is acquired as a low-frequency component, and  $1/2 \{ (Cy+Mg)-(Ye+G) \} = B-G/2$  signal is acquired as a modulation component.

[0015] Therefore, by using correlation of 1H period, two kinds of color-difference signals, R-G [ the luminance signal of R+B+3/2G and ]/2, and B-G/2, are obtained, and the signal corresponding to the standard television signal can be formed.

[0016] On the other hand by the 2nd scanning method, the signal of the Nth line and a line (N+1) is simultaneously read to nH eye in the odd field. As a low-frequency component,  $2x1/2 \{ (Cy+G+Ye+Mg) = 2R+2B+3G \}$  signal  $2x1/2 \{ (Cy+G)-(Ye+Mg) \} = -(2R-G)$  signal is acquired as a modulation component, and the signal of a \*\* (N+2) line and a line (N+3) is simultaneously read to eye H (n+1). Since  $2x1/2 \{ (Cy+Mg+Ye+G) = 2R+2B+3G \}$  signal is acquired as a low-frequency component and a  $2x1/2 \{ (Cy+Mg)-(Ye+G) \} = 2B-G$  signal is acquired as a modulation component, a signal of the same kind can be acquired by the same signal-processing method as the time of the 1st scanning method.

[0017] However, in the even field, a \*\* (N+1) line and a line (N+2) are simultaneously read to an n'H eye. A \*\* (N+3) line and a line (N+4) are simultaneously read to eye 'H. an n'H eye and eye '(n+1) H (n+1) As a low-frequency component Since a  $\{ (Cy+G)+(Cy+Mg)-(Ye+Mg)-(Ye+G) \} = B-R$  signal is acquired for  $1/2 \{ (Cy+G)+(Cy+Mg)+(Ye+G) \} = 2R+2B+3G$  as a modulation component, By the same signal-processing method as the time of the 1st scanning method, color separation cannot be performed and a signal of the same kind cannot be acquired.

[0018] Therefore, when each field applies the color solid state image pickup device to which the color filter with which a required signal is acquired was allotted to an electronic still camera by the 1st scanning method as shown in drawing 5 or drawing 6 and it is used by the 2nd scanning method, it is necessary to perform read-out of the signal corresponding to the photographic subject image accumulated to the solid state image pickup device using the optical shutter synchronizing with the field where a required signal is acquired (with that is, frame synchronization).

[0019] Thus, the example of the constituted electronic still camera is shown in drawing 7. In this drawing, a lens 1 and 2 extract 1. a shutter and 4 3 A solid state image pickup device, In 5, a digital disposal circuit and 6 an exposure control circuit and 9 for a photometry element and 8 A solid-state-image-pickup-device scanning-method change-over switch, 13 the record method change-over switch and 12 for an element drive circuit and 11 A recording head change-over switch, 14 -- a recording device and 15 -- for the 1st record section and 18, as for a recording-mode change-over switch and 20, the 2nd record section and 19 are [ the 1st recording head and 16 / the 2nd recording head and 17 / a synchronizing signal generator and 21 ] gate circuits

[0020] Next, operation of drawing 7 is explained. It is led to the photometry element 6 through a lens 1, a photographic subject's luminosity is measured, a proper exposure is determined in the exposure control circuit 8 by the information from this photometry element 6, and the light from a photographic subject (not shown) is extracted based on this value at the time of a photographic subject image pck-up, and controls the time of drawing of 2, and the shutter second of a shutter 3 to the value which gives proper light exposure to the fixed image pck-up element 4.

[0021] And in the driving signal (it shall synchronize with the synchronizing signal generated from the synchronizing signal signal generator 20) generated from the element drive circuit 13, it is scanned by the driving signal switched by the scanning-method change-over switch 9, a signal charge is read, and a solid state image pickup device 4 is led to a digital disposal circuit 5. The signal processed by the digital disposal circuit 5 by the signal aspect suitable for record to a recording device 14 is led to the record method change-over switch 11.

[0022] On the other hand, when a frame recording mode and one of field recording modes is chosen and a frame recording mode is chosen by the recording-mode change-over switch 19 based on this information, the scanning-

method change-over switch 9 is switched to the direction of Terminal A, and the record method change-over switch 11 is switched to the direction of Terminal A.

[0023] Moreover, when a field recording mode is chosen for the recording-mode change-over switch 19, the scanning-method change-over switch 9 is switched to the direction of Terminal B, and the record method change-over switch 11 is switched to the direction of Terminal B. In addition, after the gate of the driving signal for the 1st driving signal for performing said 1st scanning method performing said 2nd scanning method for an element 13 although the signal from the element drive circuit 13 is drawn directly is carried out according to a field distinction signal by the gate circuit 21, it is led to the terminal A of the scanning-method change-over switch 9.

[0024] As described above, since a required signal is acquired only by the scan of the field of the odd field and one of the even fields, this is for performing signal-charge read-out from a solid state image pickup device synchronizing with the suitable field in the 2nd scanning method. For example, reading of the charge corresponding to the photographic subject image which is led to a solid state image pickup device 4, and is accumulated is performed during the odd field by opening a shutter in the case of the solid state image pickup device which had the color filter shown in drawing 5 or drawing 6 allotted.

[0025] thus, when a frame recording mode is chosen A solid state image pickup device 4 is scanned by the 1st scanning method. the signal from a digital disposal circuit 5 It is led to the terminal A of the record method change-over switch 11. to the 1st field eye, this signal by the head change-over switch 12 to the 1st recording head 15 It is led to the 2nd field eye at the 2nd recording head 16, and the signal of the 1st field is recorded on the 1st record section 17, and the signal of the 2nd field is recorded on the 2nd record section 18, respectively. Moreover, when a field recording mode is chosen, a solid state image pickup device 4 is scanned during [ when a signal required of the 2nd scanning method is acquired ] the field, and the signal from a digital disposal circuit 5 is led to the terminal B of the record method change-over switch 11, and is recorded on the 1st record section 17 by the 1st recording head 15.

[0026]

[Problem(s) to be Solved by the Invention] With the image pck-up equipment which used the drive method of the conventional solid state image pickup device which was described above, and this drive method, although the video signal of interlace scanning is obtained, it cannot obtain the video signal of sequential scanning, but can obtain neither a personal computer nor the good image pck-up equipment of adjustment with a communication field.

[0027] this invention aims at offering the drive method of the image pck-up equipment which can solve this technical problem and can obtain a sequential-scanning video signal using the existing solid state image pickup device, and the solid state image pickup device for it.

[0028]

[Means for Solving the Problem] In order that this invention may solve the above-mentioned trouble, By reading, after mixing the signal charge of two pixels which adjoin perpendicularly the scanning state of the level pixel train of a fixed image pck-up element of having a level pixel train more than 2-N (N being two or more integers) line perpendicularly The drive method of the solid state image pickup device characterized by making into the always same level pixel train combination of two level pixel trains read simultaneously by the \*\* perpendicular scanning interval by one horizontal scanning in case the signal of two adjoining level pixel trains is simultaneously read by one horizontal scanning and a full screen is scanned in 1 vertical-scanning period, And the solid state image pickup device which has a level pixel train more than 2-N (N is two or more integers) line perpendicularly, By reading, after mixing the signal charge of two pixels which adjoin the scanning state of the level pixel train of this solid state image pickup device perpendicularly The solid-state-image-pickup-device drive circuit which makes combination of two level pixel trains read simultaneously the always same level pixel train by the \*\* perpendicular scanning interval by one horizontal scanning in case the signal of two adjoining level pixel trains is simultaneously read by one horizontal scanning and a full screen is scanned in 1 vertical-scanning period, It is image pck-up equipment characterized by having the digital disposal circuit which processes the aforementioned solid-state-image-pickup-device output signal, and outputs the video signal of sequential scanning of a number of vertical-scanning lines N book.

[0029]

[Embodiments of the Invention] Drawing 1 is the block diagram showing the form of operation of this invention. The color solid state image pickup device to which a lens and 2 could extract 1 in this drawing, and the scanning method as shows 3 to a shutter and shows 4 to drawing 2 and drawing 3 could be switched and to which the color filter was allotted, In 5, a digital disposal circuit and 6 an exposure control circuit and 9 for a photometry element and 8 A solid-state-image-pickup-device scanning-method change-over switch, 10 the record method change-over switch and 12 for an element drive circuit and 11 A recording head change-over switch, 14 -- for the 2nd recording head and 17, as for the 2nd record section and 19, the 1st record section and 18 are [ a recording device and 15 / the 1st recording head and 16 / a recording-mode change-over switch and 20 ] synchronizing signal generators It is led to the photometry element

6 through a lens 1, a photographic subject's luminosity is measured, the proper exposure quantity of light is determined in the exposure control circuit 8 by the information from this photometry element 6, and the light from a photographic subject (not shown) is extracted based on this value at the time of photographic subject photography, and controls the time of the drawing value of 2, and the shutter second of a shutter 3 to the value which gives proper light exposure to a solid state image pickup device 4.

[0030] And in the driving signal generated from the number of times 10 of an element drive, it is scanned by the driving signal switched by the scanning-method change-over switch 9, a signal electric charge is read, and a solid state image pickup device 4 is led to a digital disposal circuit 5.

[0031] In addition, the driving signal synchronizes with the synchronizing signal generated by the synchronizing signal generator 20. The signal processed by the digital disposal circuit 5 by the signal aspect suitable for record to a recording device 14 is led to the record method change-over switch 11. On the other hand, when a frame recording mode and one of field recording modes is chosen and a frame recording mode is chosen by the recording-mode change-over switch 19 based on this information, the scanning-method change-over switch 9 is switched to the direction of Terminal A, and the record method change-over switch 11 is switched to the direction of Terminal A.

[0032] Since the 1st driving signal for performing the 1st scanning method stated by the term of explanation of the conventional example is led to this terminal A, one level line will be read one by one in 1 horizontal scanning period in order of the scanning described, for example in the 1st scanning method of drawing 2 or drawing 3, signal read-out of a full screen will be performed in 2 field periods, and the signal for the 2 field, i.e., the 1 field, is acquired.

[0033] After this signal is processed by the digital disposal circuit 5, it is led to the terminal A of the record method change-over switch 11, this signal is led to the 1st field eye at the 1st recording head 15, and is led to the 2nd field eye at the 2nd recording head 16, the signal of the 1st field is recorded on the 1st record section 17, and the signal of the 2nd field is recorded on the 2nd record section 18 by the head change-over switch 12, respectively.

[0034] In addition, about the time of this frame recording mode, since the scanning method of the solid state image pickup device to which the color filter shown in drawing 2 and drawing 3 was allotted is the same as the conventional example, all the signals acquired also become the same.

[0035] On the other hand, when a field recording mode is chosen by the recording-mode change-over switch 19, the scanning-method change-over switch 11 is switched to the direction of Terminal B. The 2nd driving signal which reads simultaneously the signal of two level lines which adjoin each other by one horizontal scanning, and performs signal read-out of a full screen in 1 field period is led to this terminal B.

[0036] Unlike the conventional example, the scan by this 2nd driving signal like drawing 2 and the scanning sequence described in the 2nd scanning method of drawing 3. The group of two level lines which read the odd field and the even field simultaneously by one horizontal scanning. The allotted color filters are the two same level lines, and even if you read to which field period, let the required signal be the scanning method obtained by the output of a digital disposal circuit 5 by the same signal-processing method as the time of a frame recording mode.

[0037] Therefore, at the time of a field recording mode, synchronizing with the vertical synchronizing signal immediately after not frame synchronization but a photography end, it is got blocked, and the photographic subject image which opened and photoed the shutter can be read by field synchronization.

[0038] Thus, it is led to the terminal B of the record method change-over switch 11, the read signal being processed by the same digital disposal circuit 5 as the time of frame record, and being used as the same signal aspect as the time of frame record, and is recorded on the 1st record section 17 by the 1st recording head 15.

[0039] [Effect of the Invention] As described above, this invention By reading, after mixing the signal charge of two pixels which adjoin perpendicularly the scanning state of the level pixel train of the solid state image pickup device which has a level pixel train more than 2-N (N is two or more integers) line perpendicularly By making into the always same level pixel train combination of two level pixel trains simultaneously read by one horizontal scanning by the \*\* perpendicular scanning interval, in case the signal of two adjoining level pixel trains is simultaneously read by one horizontal scanning and a full screen is scanned in 1 vertical-scanning period, the existing solid state image pickup device is used. The video signal of sequential scanning can be obtained, a personal computer and the good photography equipment of adjustment with a communication field can be obtained, and the effect on industry is large.

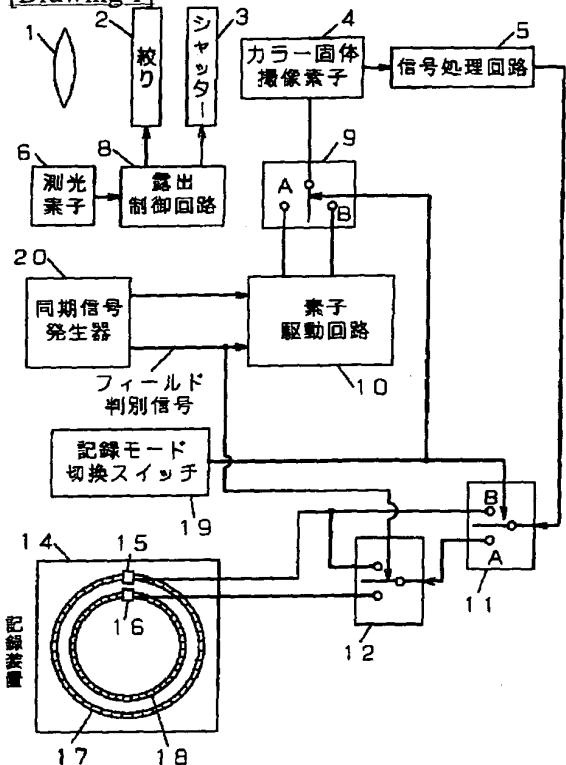
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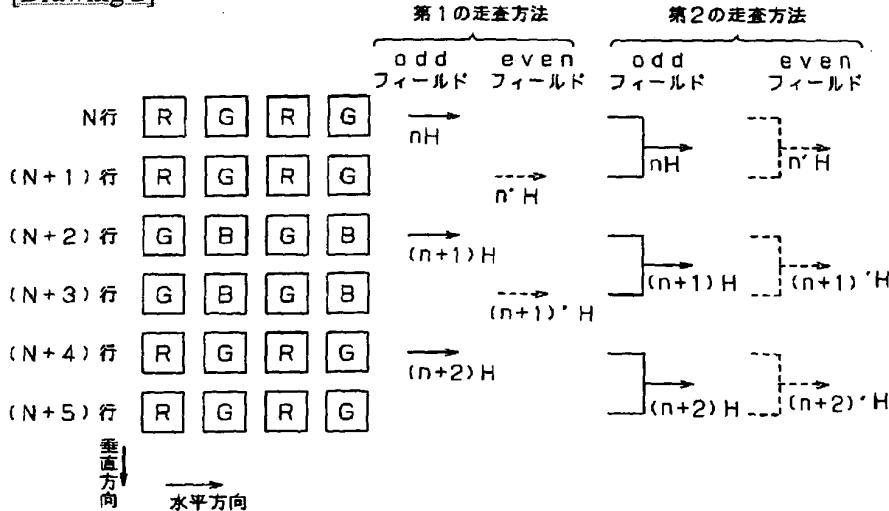
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## DRAWINGS

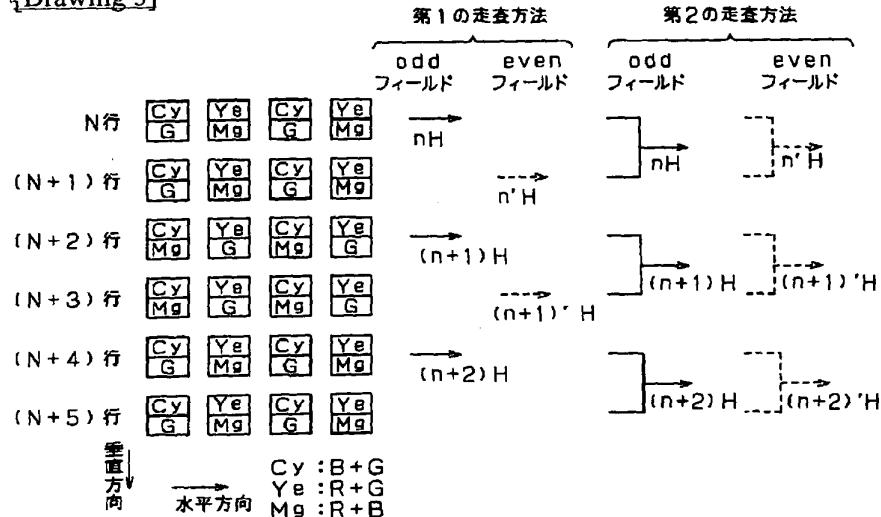
[Drawing 1]



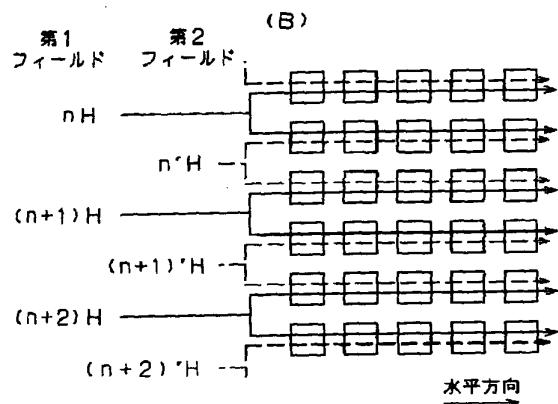
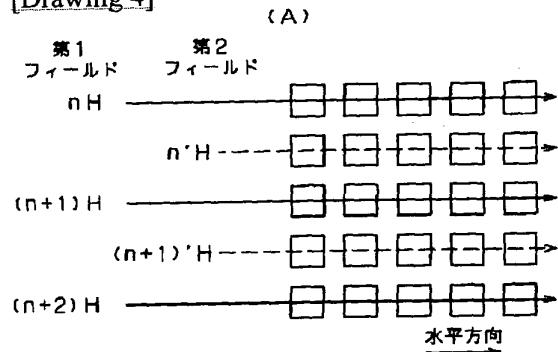
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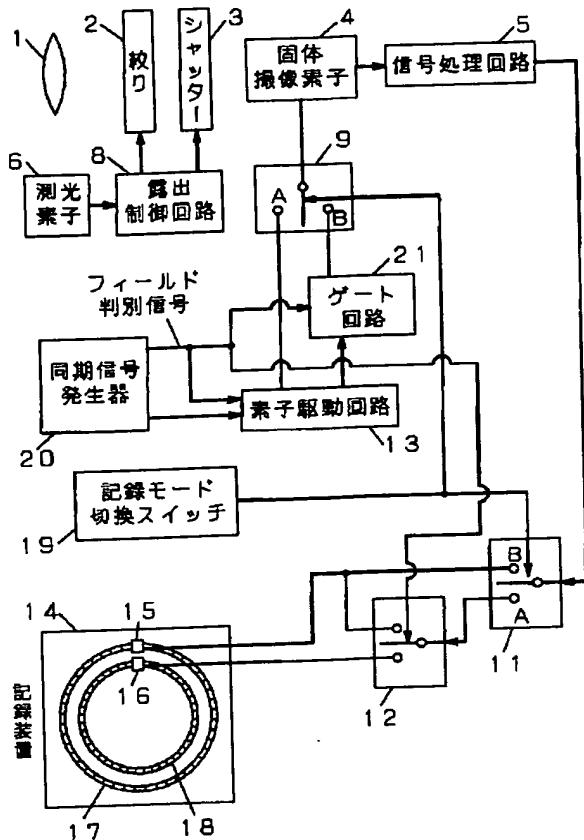
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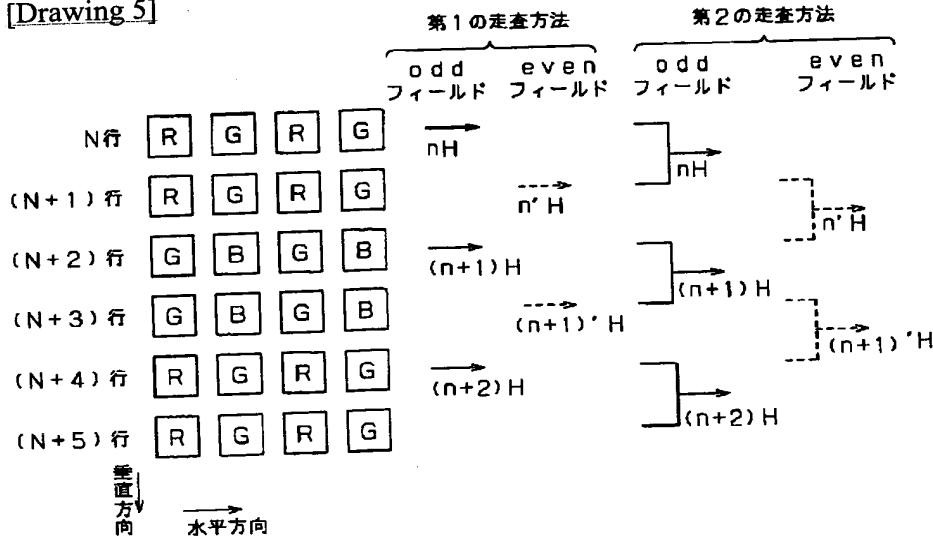
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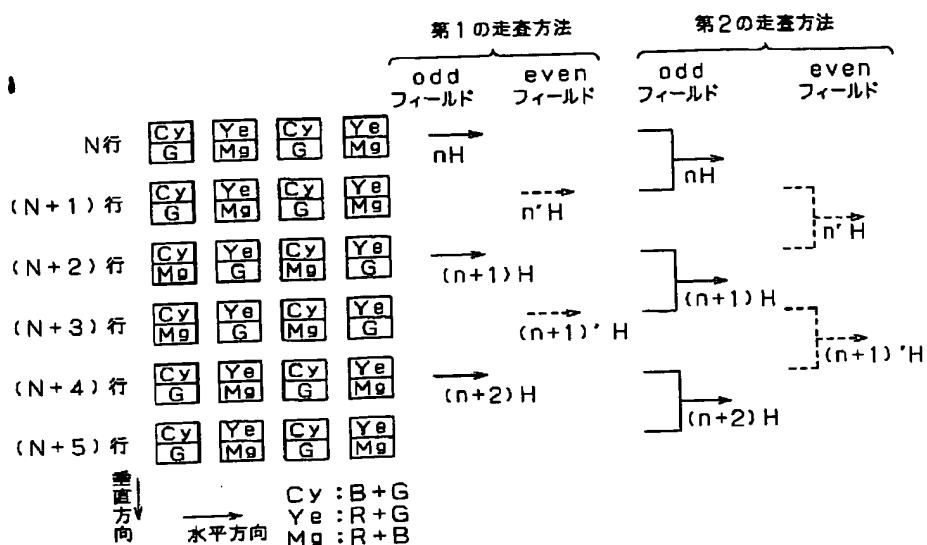
## [Drawing 7]



### [Drawing 5]



[Drawing 6]



[Translation done.]